

# Light and Lighting

Official Journal  
of the  
Illuminating  
Engineering  
Society

Incorporating  
"The  
Illuminating  
Engineer."

32, Victoria Street, London, S.W.1.

Telephone : ABBey 5215

Vol. XXXIX.—No. 12

December, 1946

PRICE NINEPENCE  
Subscription 10/6 per annum, post free

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## Railway Lighting

THE paper on this subject, read before the I.E.S. on December 10 (see page 211), put lighting in the forefront amongst obligations of railways, and rightly so.

Light is traditionally associated with travelling. To the pilgrim on foot the glimpse of the lights of a distant inn brought assurance of rest and comfort; to the mariner the beacon on shore was a token that his perilous journey was safely ended.

To-day our demands from light are more complex. On the railways they involve not only the safety of the line, the passengers and the staff, but the conferring of some degree of convenience, comfort and pleasure during the journey.

The authors—Mr. Cunningham in particular—have long experience and special knowledge of this subject. It is significant that they have devoted little space to tables of foot-candles but have devoted themselves mainly to *qualities of light*—amongst which reliability in operation and easy maintenance take a leading place.

Lighting fittings must not only perform their duty of revealing surrounding objects; they should also be robust and fool-proof and even, on occasion, "hooligan-proof" as well.

## NOTES & NEWS ON

# ILLUMINATION



### **Lighting Practice in Germany**

Interesting information on lighting developments in Germany is to be found in a recently issued report prepared by the Field Information Agency, Technical (United States Group Control Council).<sup>\*</sup> In general, as might be expected, no material progress in illumination, except for special war purposes, took place during the period of the war. Lighting practice and standards of illumination were, however, considered to be equal to, or better than, those in the U.K., but lower than those in the U.S.A.—one exception being high-class domestic lighting, embodying marked advances, built-in lighting being a feature. Little polished material is used for reflectors, probably due to conservation of essential metals (aluminium, chromium, etc.), but special research has been devoted to polished silver, efforts being made to check oxidising, peeling, and similar causes of deterioration. A feature of diffused lighting units is the relatively large enclosing globes, resulting in lower surface brightness. For street lighting close spacing, high mounting, and sharp cut-off provide easy seeing conditions. Arterial highways, however, were invariably lighted with sodium lamps, in some

cases on 100 ft. spacing. Sodium vapour lamps in Germany are of the arc type (considered far superior in efficiency and life to the glow-type). Arc sources, both flame and crater types, are largely developed, types taking up to 1,000 amperes operating current being reported. Fluorescent lamps were not in large production. In regard to lighting education it is observed that most of the Technical High Schools in Germany conducted regular courses in Illuminating Engineering and awarded degrees—which very few educational institutions in the United States have attempted to do. It is remarked, however, that illuminating engineering should not be regarded as an exact science. Aesthetics as well as technical data should be considered, and satisfactory lighting installations are usually the product of “imagineering.”

### **Ideal Home Exhibition**

An encouraging indication of recovery post-war is the announcement that the Ideal Home Exhibition is to be held once more next spring. Olympia will display, over 12 acres and for 12 hours a day, from March 4 to March 29, 1947, the possibilities of the modern home, and it is stated that nothing will be “for export only.” Let us hope that lighting will play a worthy part in this display.

\*British Intelligence Objectives Subcommittee, F.I.A.T. Final Report, No. 274. (H.M. Stationery Office. 1s. 6d. net.)

## Forthcoming I.E.S. Meetings

(Provisional List)

### SESSIONAL MEETINGS IN LONDON

1947.

- Jan. 14th. DR. W. D. WRIGHT on Colour in Illuminating Engineering. (At the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.) 6 p.m.  
 Feb. 11th. MR. J. B. S. SMYTH on Experiments on the Design and Illumination of Traffic Signs. (In the House of The Royal Society of Arts, 6, John Adam Street, London, W.C.2.) 6 p.m.

### MEETINGS OF CENTRES AND GROUPS

1947.

- Jan. 2nd. MR. E. H. PENWARDEN and MR. S. ANDERSON on New Lighting for Old Buildings. (At Gloucester.) 7 p.m.  
 Jan 3rd. MR. D. C. JAMES on Store and Display Lighting. (At Radiant House, Bristol.) 7 p.m.  
 Jan. 3rd. DR. J. H. NELSON on Industrial Decoration. (At Imperial Hotel, Temple Street, Birmingham.) 5.30 p.m.  
 Jan. 3rd. Four 15-minute papers on Lighting as Applied to:  
   1. Churches, by MR. C. S. CAUNT.  
   2. Drawing Offices, by MR. A. S. HACKMAN.  
   3. Hospitals, by MR. E. G. PHILLIPS.  
   4. Schools, by MR. N. C. SLATER.  
   (At The City of Nottingham Gas Dept., Demonstration Theatre, Parliament Street, Nottingham.) 5.30 p.m.  
 Jan. 6th. MR. H. W. HIME on The Physics of Electric Discharge Lamps. (At the Electricity Showrooms, The Headrow, Leeds.) 6 p.m.

1947.

- Jan. 8th. Domestic Lighting Problems. Question-Master: PROFESSOR T. DAVID JONES. (At the Cardiff Corporation Demonstration Theatre.) 3.15 p.m.  
 Jan. 8th. Address by the President (MR. J. S. DOW) and a Social Function. (At the Minor Durant Hall, Oxford Street, Newcastle-upon-Tyne.) 6.15 p.m.  
 Jan. 9th. MR. E. H. PENWARDEN and MR. S. ANDERSON on New Lighting for Old Buildings. (At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.3.) 6 p.m.  
 Jan. 10th. MR. E. H. PENWARDEN and MR. S. ANDERSON on New Lighting for Old Buildings. (At Heriot-Watt College, Chambers Street, Edinburgh, 1.) 6.30 p.m.  
 Jan. 14th. MR. E. WOOD on Hot Cathode Tubular Fluorescent Lamp Circuit Analysis. (At the Electricity Showrooms, Market Street, Huddersfield.) 7 p.m.  
 Jan. 14th. MR. T. S. JONES on School Lighting. (At the Corporation of Leicester Electricity Dept., Demonstration Theatre, Charles Street, Leicester.) 6.30 p.m.  
 Jan. 14th. Members' Night. (At the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.) 6 p.m.  
 Jan. 15th. MR. W. J. G. DAVEY on Short Cuts in Illuminating Engineering. (At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.) 6 p.m.  
 Jan. 16th. DR. J. W. T. WALSH on The Measurement of Light. (At the Reynolds Hall, College of Technology, Sackville Street, Manchester.) 6 p.m.  
 Jan. 16th. MR. N. C. SLATER on Industrial Lighting: Erection and Installation. (At the Bradford Corporation Electricity Offices, Sunbridge Road, Bradford.) 7.30 p.m.  
 Feb. 3rd. MR. E. A. FOWLER on Practical Aspects of Interior Lighting Installations. (At Electricity Showrooms, The Headrow, Leeds, 6.) 6 p.m.

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programme, mentioning subject, author, place, date and time of meeting; summaries of proceedings at meetings (which should not exceed about 250-500 words) and any other local news are also welcome.)



A group taken on the occasion of the luncheon arranged by the I.E.S. Bristol Centre, and mentioned in our last issue (p.190). Those in the group, reading from left to right, are: Mr. L. C. Rettig (Chairman of the Centre), Mrs. Rettig, The Mayoress of Bristol, The Lord Mayor of Bristol, Mr. J. S. Dow (President, I.E.S.), The Mayoress of Bath, and the Mayor of Bath. The luncheon was attended by 113 people, amongst whom were included representatives of the architectural profession, works engineers and others prominently associated with local industries and activities.

### "The Evolution of Lighting"

At the first meeting of the session of the I.E.S. Birmingham Centre the new chairman, Mr. R. Mackenzie, delivered an address on "The Evolution of Lighting," in the course of which he dealt at some length with the history of public lighting in Birmingham. He traced developments from the original linkboys and cresset bearers, through the stages of candle, oil, gas, and electricity up to the modern electrical discharge lamp and the present installation, which includes some 44,000 lighting points. This is a subject on which Mr. Wadeson, who has spent 45 years with the Corporation lighting department, can speak with special knowledge.

instance was afforded by a recent visit of Nottingham members to the works of John Player and Sons, where two hours were spent in viewing processes of tobacco manufacture, with special reference to lighting for such processes. The adjacent picture is reproduced from a photograph taken on the steps of the main offices.

### Nottingham I.E.S. Centre

An excellent plan, now becoming usual with I.E.S. Centres, is to include supplementary items in their programmes, such as visits of local interest, etc., in addition to formal meetings. An



# Railway Lighting

Summary of a paper read by Mr. A. Cunningham and Mr. G. Golds at the meeting of the Illuminating Engineering Society held in London on December 10th, 1946.

In the paper on the above subject read at the last I.E.S. meeting on December 10 the authors provided an excellent review of problems based on past experience and reinforced this by some interesting speculations on future methods, of which trials are now proceeding.

## Safety of Public and Staff

"The Safety of the Line" is a traditional pre-occupation of railway engineers. Permanent way maintenance has always had priority, but other factors affecting the safety of passengers and staff must be considered. In this connection lighting often plays a conspicuous part. Quality of lighting is often of great importance, and this is closely associated with the nature of surroundings and backgrounds. Surfaces having a good reflection coefficient are vital, as is illustrated by the effect of the light-tiled walls in the Tubes, but other railways seem reluctant to follow suit—perhaps because of difficulty in keeping light surfaces clean. Another important point—brought home during the war—is the value of alternating patches of light and dark material, for example on staircases and as a means of enabling passengers getting ready to alight from trains to see the limits of the platform and to recognise when a train has not quite stopped. Heavy risks are necessarily taken by

many of the staff when on duty. There is a natural tendency, for the sake of economy, to concentrate light mainly at essential points, but background illumination helps considerably towards safer and more efficient working.

## Importance of Reliability

In considering the choice of lighting equipment first priority must be given to reliability. Other factors coming next are robust and foolproof construction, absence of glare, and dark shadows and provision for deterioration due to adverse atmospheric conditions. Reliability is not merely a question of good materials and robust construction. Over-elaboration must be carefully avoided. Premises are inevitably left almost unattended for long periods, during which the public may have access at all times of the night and day. Fittings, therefore, should be not only fool-proof, but "hooligan-proof."

## Special Problems on Railways

Absence of glare and dark shadows are very important in the interests of safety, both on platforms, where luggage is often carelessly disposed so as to form an obstacle, but still more in shunting yards where life itself may be involved. Such conditions as diffusion and freedom from glare are often much more important than the intensity of illumination, high values of which are not alone sufficient. Railway premises, and more especially locomotive sheds and yards, are almost unique in one respect—the extraordinarily adverse atmosphere produced by the combination of soot and sulphurous fumes with the moisture due to condensation—leading sometimes to very rapid deterioration which has to be seen to be believed.

Among the special problems mentioned are those in locomotive depots, goods sheds, shunting yards, signal cabins, and stairways. Locomotive

depots, as mentioned above, impose very difficult conditions in regard to maintenance—so much so that in some cases the need for incessant cleaning and replacement has led to the abandoning of reflector fittings and the substitution of bare lamps in porcelain holders.

#### Lighting of Engine Pits

The examination of engines from below and the lighting of inspection pits require special methods. A low voltage supply feeding portable lamps should be available. Recently a scheme involving the use of fluorescent lamp tubes pits constructed of pre-cast concrete sections, equipped with prefabricated recesses to hold the lamps, has given excellent results. Another ingenious device is the use of a trolley, mounted with a fluorescent lamp at about 18 in. from the ground, capable of being brought close to the area to be studied. Covered-in trucks or "box waggons" are largely used and some means of illuminating their interiors must be contrived. One idea is to make the truck of translucent but robust plastic material so that its interior receives benefit from the general illumination, whether natural or artificial.

#### Floodlighting of Shunting Yards

Dealing with shunting yards the authors refer to the complexities of "hump" shunting and the need for good illumination of the vertical surfaces at the ends of waggon, besides a general background illumination over the whole area. Floodlighting from high towers has been adopted in the U.S.A. In this country experiments have recently been made with high elevation lighting from units attached to a barrage balloon at about 150 ft. above the ground. Results were favourable and it is now proposed to erect a light steel mast with a ring-shaped

fitting, capable of being raised or lowered by a winch.

#### Subdued Lighting in Signal Cabins

In many signal cabins it is of the highest importance that the signalmans should be able to see through the windows and observe what is happening outside. His eyes should, therefore, be kept in a permanently semi-dark-adapted state. Efforts must be made to eliminate any reflections of lamps in the glass of the cabin liable to dazzle the eyes. Subdued and well-screened lighting is expedient.

In connection with stairways the authors stress (1) the need for contrast between the front edge of a tread and the remaining portion, and also contrast between treads and risers, (2) avoidance of glare, and (3) avoidance of confusing cross shadows. Of these the first requirement is the most important. By means of a small scale model the authors illustrated, however, how all apply.

Dealing with future developments the authors stress the value of the fluorescent lamp in many fields, e.g., in inquiry offices where clerks are subjected to prolonged strain, and in passenger coaches. They also review various developments affecting the safety and comfort of passengers, such as direction signs, station name signs, train indicators and time-table boards, and safety lighting on platforms and stairways. An old Board of Trade regulation prescribed that each lamp lighting a platform should exhibit the name of a station. Allusion is made to modern designs for illuminated name signs, of special interest being the large lettering signs mounted well away from the track and giving an indication of the station about to be approached, to the method used at Waterloo of illuminating timetables from behind and the treatment of train departure indicators.

## The Problem of Cinema Lighting

An interesting topic was discussed before the Manchester I.E.S. Centre on October 3, when Mr. H. Elder described the lighting of a local cinema completed shortly before the outbreak of war.

Mr. Elder began by pointing out that an architectural problem is, to an architect, different from a problem in illumination to an illuminating engineer, for, whereas the latter is a specialist, the architect combines the work of many specialists into one whole—the building.

This is well illustrated in such a building as a cinema, which comprises two parts, that holding the audience and that in which the screen is located. The comfort and convenience of the audience and the presentation of the picture involve two different sets of conditions—when the auditorium is lighted and the screen is not, and *vice versa*. The linking of these two different sets of conditions is essentially a problem.

The theatre is of medium size, accommodating about 1,200 persons, chiefly on the floor, though there is a small balcony. The room is "fan-shaped," i.e., from the screen the auditorium widens rapidly, the average width being 60 ft. No proscenium or definite line separating audience from screen has been designed. The white picture screen, without any surround, projects from the rear wall, which is covered with corrugated asbestos sheets left in their natural grey colour, so that the contrast between screen and surroundings is less than that usually found.

When pictures are not being shown the auditorium is lighted by five recessed ceiling fittings equipped with 500-w. lamps and reflectors, whilst round the fittings a band of neon gives the ceiling a blue tint. The wings near

the picture are lit decoratively, no illumination being required from this source, and the screen is covered by a white velvet curtain. Apart from the blue neon lighting no effort has been made to introduce colour effects. (The author does not consider that the auditorium should be treated as a showroom for changing colours and intensities.)

The transition from one stage of lighting to another is of prime importance. Subtle and progressive dimming has been devised. The five ceiling fittings are dimmed in succession, leaving the wings illuminated. These are, in turn, also dimmed individually towards the white curtain over the screen, so that the eye is automatically led to the centre of interest.

The picture thrown upon the white curtain does not create the usual harsh contrast between white and black. When the white curtains are drawn aside a picture set forward from the back wall is revealed. Concealed lighting has been introduced, forming a surround of light reducing the edge of picture contrast, but apparently increasing contrasts within the picture area itself and giving the impression that the picture is nearer the audience than it actually is. At the end of the entertainment the process of lighting is again gradual, this time commencing at the screen and extending to the auditorium.

We note that at a subsequent meeting of the Manchester Centre on November 14, Mr. R. O. Ackerley and Mr. Alister MacDonald repeated their joint contribution entitled "The Place of Science in the Art of Lighting." The meeting was arranged jointly with the Manchester Society of Architects, and this ingenious "turn" proved again to be a great success.

This type of "illustrated dialogue" has obvious possibilities and might well be applied to various fields of lighting—especially those in which the user often has views of his own.

## Research on Display Window Lighting

We learn with interest of the enterprising action taken by a Liverpool firm, Messrs. Lewis's, Ltd. (Departmental Stores), who have sponsored the establishment of a research fund to facilitate the study of display window lighting. The primary object of the research is stated to be the elimination of glare and troublesome reflections — both evils which have long proved difficult in connection with show-window lighting. The work is to be carried out in the Department of Electrical Engineering at Liverpool University, in conjunction with the Chief Engineer of Lewis's, Ltd., and the value of the fund is £200 per annum for seven years.

Two thoughts are suggested by this generous and enterprising action. Firstly, this is surely the type of firm that should be in some fitting way linked to the Illuminating Engineering Society.

Secondly, where one has acted, others may follow. It would be a great thing gained if commercial and industrial concerns would take similar action in regard to lighting problems that bother them — promoting and encouraging researches where this seems needful and inviting the aid of the I.E.S. when doing so.

## Appointment of City Electrical Engineer of Nottingham

It was recently announced that the Nottingham Corporation Electricity Committee has recommended the appointment of Mr. Maurice Wadeson for the post of City Electrical Engineer. Mr. Wadeson, who has been filling the post of city deputy electrical engineer, is a past chairman of the I.E.S. Nottingham Centre. He is also associated with the Institution of Electrical Engineers and other technical societies.

## Obituary

### G. H. WILSON

We record, with great regret, the passing away on November 17, of Mr. G. H. Wilson at the early age of 45 years.

Mr. Wilson, a Fellow of the I.E.S. and a member of over 20 years' standing, was an outstanding figure in illuminating engineering. Educated at Finsbury Technical College, he joined the G.E.C. Research Laboratories in 1922, and was mainly responsible for the building up of the illuminating engineering laboratory and department at Wembley.

He took a leading part in the work of the Society, serving on the Council and on many committees, and was equally prominent in the work of the British Standards Institution, the National Illumination Committee, and the International Illumination Commission. As a

lecturer and demonstrator he excelled in the highest degree, and he was responsible for numerous papers, informative in substance and delightful in delivery, at meetings of the I.E.S., the A.P.L.E., and other bodies. He also acted as one of the examiners in illuminating engineering for the City and Guilds of London Institute.

To great intellectual gifts there was joined a most conscientious and upright character that won the respect of everyone and a genial and sunny disposition that endeared him to all his friends.

It was characteristic of him that, holding strong and deep convictions in regard to warfare, he felt it his duty to withdraw from any work associated with war effort. No one doubted the sincerity of his motives, and the high esteem in which he was held was in no wise diminished. It is indeed a pity that so promising a career should have been thus brought to an early close.

## Lighting Road Roundabouts— and an Interesting Experiment

By A. GREENAWAY BROWN,  
A.C.G.I., F.I.E.S.

There are 8,150 miles of trunk roads in this country and they have a large number of junctions and crossings. Roundabouts have been constructed at some of the junctions and are presumably in course of construction at others. These are all potential danger spots both by day and by night and there are others on other roads. They are dangerous because they are meeting points where collisions are likely to occur between one vehicle and another, and between a vehicle and a pedestrian, and between a vehicle and the obstruction constituted by the island.

How can these accidental collisions be minimised? One method is by the use of fly-over crossings, but in the large majority of cases these are not a practical proposition. In most cases the solution lies in helping the road users to realise that they are approaching a dangerous position and helping them to see how to negotiate the situation. The driver of a modern relatively fast moving vehicle must be able to recognise a roundabout for what it is from some distance away.

He must then be able to see the shape of the obstruction in the road and the route he has to take round it. Further, he has to see clearly what other road users there are in the track he wishes to pursue. This is not an easy visual task and requires powers of concentration. The task, however, can be facilitated and the passage of the vehicle made safer if the construction of the detail of the site are studied.

For clear vision objects should be seen in sharp contrast with their background. In the past various methods have been used in endeavours to secure the best day and night visibility of and in roundabouts.

Contrast of colour or more fundamentally of brightness has to be provided

at roundabouts in order that there may be vision. In addition, the shape of the island should be readily discernible, and the driver of a fast vehicle requires to be warned in advance of the hazard ahead.

Each of these aspects is now discussed separately in an endeavour to reach a practical solution to aid road users both by day and by night.

### Brightness Contrast

To state the obvious, seeing is performed by brightness and colour contrasts. Objects are seen by the contrast they form against their background or the variations in shade of their own surface. For the quick and distant vision necessary at a road junction, background brightness is probably the most important. If all objects on the road, pedestrians, cyclists, and vehicles could be clearly discerned against their background, many accidents would be avoided. The large roundabout island in the road will form at some time the background against which the objects are seen. If it is made black all objects of light hue will be seen, and if white all darker objects. Since the clothing of people and colour of vehicles are of all shades, the best colour for the island will be partly black and partly white. A checkered board fence of black and



Showing a general view of the model roundabout.



Fig. 1. Design as seen by night showing self-illuminated glass wall.

white has been tried out, and many people have found it of considerable help. Checks of about two feet square seem to produce the best results. A fence of this nature on the roundabout is not beautiful and may be criticised as a disfigurement, but it is suggested that some modification of it may be the best solution of the problem. A wall coloured in this way is effective in daylight and will remain effective at night if artificially illuminated.

#### The Shape of Roundabouts

Some existing roundabouts are not easily recognisable at night or even in daylight, because from a distance, seen in perspective, they appear simply as a narrow band across the road, which may be mistaken for a change in the road surfacing or something else. The shape of the obstruction is not conspicuous because of foreshortening. Even if a fence is built round the island the shape may not be apparent if it is of uniform colour and brightness. Assuming a fence is curved and that it is desirable for the driver to see this curvature, a pattern is desirable on it which will show fore-

shortening when seen from the direction of any of the approach roads. Black and white vertical bands of uniform width have been tried out and proved to give reasonably good results.

#### Nature of Warning

There are very many forms of warning which can be used. The road can be painted a distinctive colour, noticeboards can be erected, etc., but it is suggested that the device should be the simplest possible and one which appears the same and remains effective in artificial light as in daylight. Night lighting has in the past generally been provided by lanterns hung from posts on the island. In fact, this method has been advocated by the British Standards Street Lighting Committee. It is generally recognised, however, that this is not the only possible method. The Engineer of the City of Nottingham, R. M. Finch, O.B.E., M.I.C.E., and E. Howard, F.I.E.S., Lighting Engineer of the City of Nottingham, in collaboration with the Research Laboratories of the General Electric Co., has designed and conducted a successful practical test of artificially

lighting a roundabout by means of a self-illuminated glass wall. The wall is three feet high, extending round the perimeter of the island, eighteen inches behind the kerb line. It is constructed in brick or stone with armour plate glass windows illuminated at night from behind. This wall provides an excellent warning at all times of the day or night.

#### The Nottingham Experiment

This self-illuminating glass wall has some excellent qualities, cleverly conceived, which are worthy of consideration. The illustration (Fig. 1) shows the design as seen at night. The roundabout in this particular case is only 50 feet in diameter, smaller than the islands used on some arterial roads. A motor-car can be seen silhouetted against the brighter wall.

The wall possesses the three desirable characteristics previously mentioned. It provides a brightness contrast background of black and white both by day and by night. Fig. 2 shows a day time view. It provides shape to the island since the vertical black bands, being uniformly spaced, are foreshortened to appear more closely spaced on the left and the right, indicating that the

obstruction is curved. And, thirdly, the wall provides a warning which can be clearly seen at any time of the day or night.

For a roundabout situated in roads which are provided with lamp-posts and lanterns it is suggested that no additional light sources would be required on the island other than those in the wall, while at roundabouts in unlighted roads the same remark applies, but lanterns may be desirable on posts located on the outer kerbs, particularly on large roundabouts.

The absence of lanterns on the centre island in lighted roads is an advantage recognised by the British Standards Institution Street Lighting Committee, who state in their latest draft specification that at roundabouts "care must be taken to avoid a confusing array of lights which may mislead the approaching driver."

Apparently the Nottingham experiment has much to commend it for providing visibility to road users. It may, however, be criticised on the score of cost. The capital cost has, however, been investigated by the City Engineer of Nottingham. For a three-foot high

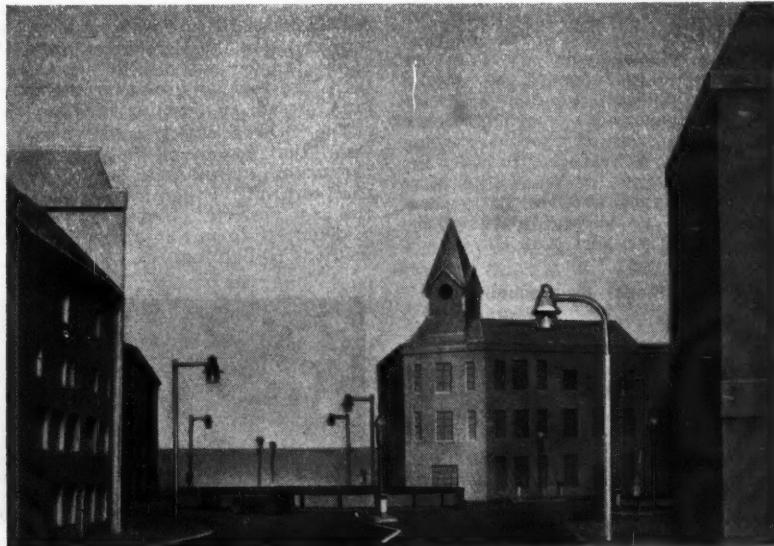


Fig. 2. Same view under daylight conditions.



**Fig. 3.** Model with self-illuminated posts.

wall constructed like a brick house with windows illuminated from within, the cost, including all the materials, erection, and electric wiring to existing underground mains, is a little less than £6 per foot length—a low figure compared with the cost of the road accidents which may be avoided by its use. The cost of maintaining it lighted at night is no more than for lighting from lanterns on tall columns.

#### Uniformity

Many road users feel that the potential danger which exists, particularly after dark, at roundabouts carrying a heavy volume of traffic justifies the Ministry of Transport giving careful consideration to this subject. In general, they welcome the use of these large islands on arterial roads, but in the case of high speed roads desire they should all have a uniform, familiar, and conspicuous appearance—the appearance acting as an easily recognised warning when seen at a distance. Possibly the Nottingham design or some other may meet the requirements of the general public and be standardised by the Ministry of Transport.

#### The Model Roundabout

Illustrations Figs. 1 and 2 were not taken in a street, but on a model which was constructed by the General Electric Co., Ltd., to the scale of one inch equals one yard. This model demonstrates not only the self-illuminated glass wall, but also other possible methods of rendering a roundabout conspicuous at night.

Fig. 3 shows the model with self-illuminated posts or bollards spaced round the central island at intervals of ten feet. Most of those people who have seen the

model agree that this system is not as effective as the glass wall since one or more of the bollards may be hidden by passing vehicles, and when this happens at night the general shape of the island as seen by a motor driver approaching from a distance is bewildering. If the bollards were more closely spaced this objection could be overcome, but then the system would have no advantage over the continuous wall.

Fig. 4 shows ordinary white posts round the island (not self-illuminated), but again at ten-foot spacing. To provide sufficient illumination in the vicinity, three tall columns with lanterns have been placed on the island near the kerb. These lanterns project light on to the island and down the approach roads, but are screened on the side nearest the centre of the island. This type of screening is recommended in the draft British Standard Specification for Street Lighting for the purpose of reducing the number of visible lanterns. If the motor driver approaching a roundabout sees an irregular bunch of lamp-posts and lanterns, he can be confused in deciding which way to steer through them. Even with this screening of the lanterns on the model, it can be seen from the photograph reproduced that the lanterns still form a confusing pattern and that the roundabout would be easier for the motorist to negotiate if there were no lanterns over the island, but, instead, an illuminated glass wall.

The General Electric Co. does not claim that the model is a perfect reproduction of full-scale conditions, nor that any of the lighting methods are the best possible. It was made simply to demonstrate on a small scale possible methods of lighting.



**Fig. 4.** Model with ordinary white post (not self-illuminated).

## American I.E.S. Convention

Held In Quebec, Sept. 18-20,  
1946

Assembled at the Chateau Frontenac in Quebec over 800 members and guests attended the eight technical and general sessions of the Annual Convention of the American Illuminating Engineering Society which was held on September 18—20 this year. A summary of the technical papers which were presented, and which will be published in full in a forthcoming issue of *Illuminating Engineering*, is given below.

Amongst the papers dealing with fluorescent lighting is one by L. F. Shorey and S. M. Gray entitled, "A Preliminary Study of Radio Interference as Caused by Fluorescent Lamps in the Home." It is pointed out that the application of circular fluorescent lamps to portable luminaires for use in homes has raised a number of problems in connection with the suppression of radio interference. The lack of a fixed ground connection due to the use of unpolarised plugs and base receptacles and the possible close proximity of the portable lamp to the radio receiver both increase the difficulty of suppression of noise to a level which is tolerable. Data are given representing preliminary results of a study of this problem.

In his paper on "Practical Colour Harmony With Fluorescent Light Sources" R. R. Wylie has attempted to present a scientific and practical approach to the development of colour harmony with fluorescent and other light sources. In the course of the paper he reviews the familiar relations between spectrophotometric measurements and the C.I.E. colour system pointing out the existing relationship between this system and the Munsell system. It is suggested that regular cyclic intervals of colour harmonies can be established between colours. Also dealing with colour and fluorescent lamps is the paper by G. B. Buck and R. N. Thayer entitled "Colour Technology of Fluorescent Lamps." In this paper methods of colour specification for light sources are dis-

cussed and colorimetric data are presented for the 4,500° white and other standard fluorescent lamp colours. The measurement of colour, its specification for manufacturing control, and the lamp-making variables which affect colour are outlined. Indications are also given of the extent of colour change in fluorescent lamps which may be encountered in practice.

Determination of the approximate light output of fluorescent lamps over a wide span of operating conditions is dealt with in the paper, "Effect of External Factors on Light Output of Fluorescent Sources," by J. C. Forbes and R. J. Diefenthaler, in which data are presented on the effect on bulb-wall temperature of a range of ambient temperatures and wind, with lamps bare, in thermal-insulating sleeves, and in luminaires of various designs.

Two papers dealing with interior lighting were "Studies of Illumination and Brightness in Residential Interiors," by E. W. Commery, and "Light for Living," by H. L. Logan. In the former the author points out that the material offered is intended to aid in the direction of rationalising two of the basic elements of lighting design in building interiors, (a) illumination values for visual application, and (b) the associated brightness values of practically all parts of the interior in which the visual applications are going to take place. The paper is offered as an introduction to the problem and puts forward certain simple proposals on which to base the rationalisation that appears to be needed for discussion and for actual working trial. The object of the latter paper is to establish definite criteria for good interior lighting.

Some aspects of store lighting are dealt with by W. F. Rooney in his paper, "A Field of Study of the Practical Factors Affecting Illumination Design for Merchandising Areas." The author remarks that discussions on this subject have repeatedly emphasised the fact that store lighting design should be based largely on the art of lighting, with consideration also to the science of lighting. Lighting for this purpose is primarily a display tool and it is necessary to think in terms of design and customer attraction values rather than in the cold logic of engineering formulae. If he can approach the task in this frame of mind the lighting specialist can be a

valuable member of the design team. Another paper entitled "Functional Store Lighting Development and Application," by F. C. Winkler, deals with general store lighting systems.

School lighting is another subject which figures in the Convention papers. R. L. Bieseile, Jr., in a contribution entitled "Integrated Lighting for Classrooms," discusses recent studies in connection with the provision of both ideal natural and artificial lighting in schools. It is pointed out that the need for ideal visual environments in classrooms and the problems involved are both great and obvious. A summary is given of a series of tests carried out in actual schoolrooms which served as an attempt to find answers to these problems.

"The Characteristics and Applications of Flashtubes," by F. E. Carlson and D. A. Pritchard, presents a considerable amount of new data defining the characteristics of such light sources and presents salient information on circuits and auxiliary equipment required in their use. The flashtube is a source of visible and related radiations produced by a condenser discharge through a gas resulting in a flash of very short duration and of a very high peak output. As a result of development prior to and during the war, flashtubes are to-day more than just a laboratory tool and are

finding wide applications in photography and photo-microscopy. Industrial research and stroboscopy furnish another field in which they have been usefully employed. Research is now being carried out on their application to signalling, television, and the production and projection of motion pictures.

Two papers of a somewhat mathematical nature were those by Parry Moon and D. E. Spencer in "A Simple Criterion for Quality in Lighting," and by Ward Harrison and Phelps Meaker in their paper, "Further Data on Glare Ratings."

Other papers included a description of the lighting systems and equipment developed by the U.S. Army Engineers to permit efficient night operation of construction machinery such as tractors, road rollers, and ditching machines. The illumination requirements of each type of machine are analysed and suitable portable and mobile area floodlighting sets are described. Results of limited field tests indicated that night work of quality equal to day work could be carried out by experienced operators at approximately 85 per cent. of the day rate. Papers were also given by G. F. Prideaux on "An Artificial Sunshine Solarium," and R. G. Slauer and L. L. Sutro on "Correlating Portable Lamp Design With the Society's Performance Recommendations."

## E.L.M.A. Illumination Design Course

The Four-Day Illumination Design Course (the 44th), conducted by the Lighting Service Bureau during October 29-November 1, was, we understand, eminently successful. Certainly the adjacent photograph of the audience suggests that the hall was filled to capacity.

The next course, an evening one, to which reference was made in our last issue, commenced on November 7 and is being given on consecutive Thursday evenings for six weeks, terminating on December 12. In this case also there was a big demand—in fact many more applications for seats than it was possible to accept were received.

We understand, however, that a similar course will probably be held early in 1947 when those disappointed on the present occasion will have another opportunity.



A photograph showing the audience at the opening of the 44th Illumination Design Course held during October 29th—November 1st, 1946.

## Lighting on the R.M.S. Queen Elizabeth

The B.T.H. Company Ltd., by whom the following information has been supplied, has contributed to the refitting of the Cunard liner, Queen Elizabeth, by supplying special lighting fittings for some of the principal public rooms.

Fig. 1 shows a view of the first-class restaurant, the average illumination over which is 7 foot-candles. The centre of the room, which has a lofty ceiling, is lighted indirectly by powerful flood-lights concealed in the luminous capitals of six dumb waiters, supplemented at the forward and aft ends by indirect floods concealed in decorative metal and glass bowls fixed high on the bulkheads. The port-holes, giving a measure of natural light in the daytime, are specially constructed to give a warm sunny effect when the ports are closed, which is achieved by concealed lamps flooding on to an angled matt reflector behind the inner false windows.

Smaller rooms adjoining the main dining-room derive their illumination chiefly from a number of recessed ceiling panels of sandblasted glass supplemented by bracket fittings mounted on the bulkheads and designed both to illuminate the tables and to lighten the ceiling. In two of the rooms the bracket

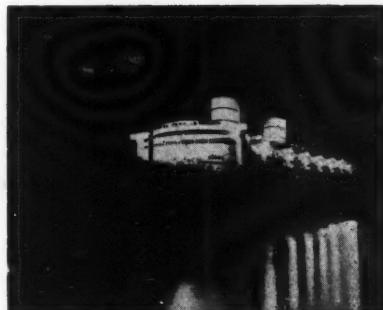


Fig. 2. The R.M.S. Queen Elizabeth  
floodlit.

fittings are fashioned to resemble decorative ships' lanterns. Similarly in other rooms throughout the ship the architect responsible for decoration has made use of the lighting to create an atmosphere of dignified luxury and comfort combined with serviceability and beauty.

In the cabin class lounge the main lighting comes from bracket fittings on pillars and bulkheads, each fitting having an inner diffusing glass bowl accommodating a 100-watt lamp. The pillar fittings incorporate cyclinders of clear glass with sandblasted vertical lines and the bulkhead fittings have translucent fluted plastic shades. A large ornate circular fitting mounted flush to the ceiling marks the centre of the room and is surrounded by rectangular dished fittings with louvred silver bronze cornerpieces. Circular diffusing glass panels let into the aft bulkhead are designed to give light from the same direction as the windows above which they are mounted, whilst on the port and starboard bulkheads the huge glass contoured maps of the Northern and Southern Hemispheres are flooded by light from luminous soffits.

Fig. 2 shows the Queen Elizabeth flood-lighted by night. The bridge is lighted by three powerful flood-lights whilst for each of the massive funnels four 1,000-watt flood-lights are used.

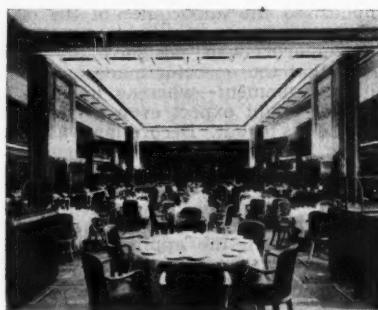


Fig. 1. The First Class Restaurant.

## Fittings for the Queen Elizabeth

A view of the first class saloon on the Queen Elizabeth, showing the large central fittings supplemented by architectural and standard lamps.



In addition to the information on the lighting of the Queen Elizabeth, appearing on another page, we have received some notes on the contribution of the General Electric Co., Ltd. This included the manufacture of fittings for the first class saloon, lounge, and wing staircases, the cabin class cocktail bar, the tourist class lounge, dining saloon, smoke room, and their respective staircases. In the first class saloon, illustrated above, the central lighting feature is a large silver bronze fitting 27 ft. 6 in. long by 12 ft. wide, in addition to supplementary architectural and standard lamps.

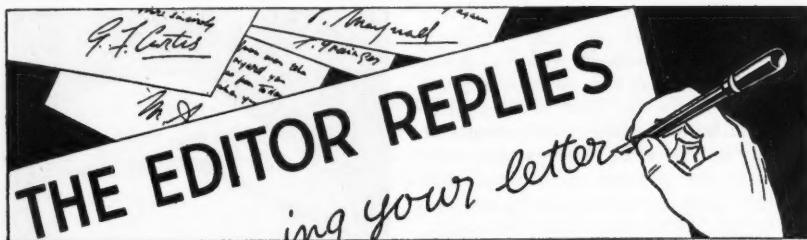
In the cabin cocktail bar Osram fluorescent lamps of the cold cathode type are used, about 64 ft. of warm, white tubes being semi-recessed into the ceiling above the bar counter. Laylights of flashed opal glass are largely used in the tourist class lounge and dining saloon. All the fittings were manufactured by the G.E.C. to the designs and specifications of Mr. Grey Wornum, F.R.I.B.A., and Mr. Waldo Maitland, A.R.I.B.A. (who have been associated for the lighting and decoration of other large vessels).

### Public Lighting and Prevention of Crime

Chief stress is commonly laid on the value of good lighting in assisting traffic at night and diminishing street accidents. There is, however, another consideration—its value as an aid to the police in dealing with crime and disorder—that should not be overlooked. This, it is stated, is one consideration that has induced the authorities in Lambeth, Paddington, and other boroughs to reject the "midnight black-out" and to maintain continuous lighting, but with fewer lamps, from dusk to daylight. In some of these areas cases of burglary and assault have been troublesome of late. The maintenance of lighting is regarded as a safeguard in this respect, and on general principles an economy achieved by using fewer lamps or mantles is considered greatly preferable to complete extinction.

### The Lighting Engineer in Industry

Mr. S. D. Lay, in a recent talk on this subject to the I.E.S. Leeds Centre, emphasised the importance of the outlook of the customer in lighting matters. An engineer who designed a pump found that the operator made use of it without comment—whereas a lighting engineer might expect even a typist to criticise his layout. Decoration was now coming to be recognised as an essential part of a lighting scheme. It was, however, no use merely splashing whitewash about; a fully considered background was essential. He mentioned cases in which the application of red paint to dangerous regions of machines had served to give a danger-signal and had rendered unnecessary the use of guards, which interfered with the lighting. The question of maintenance and cleaning is still a difficult one.



Attention has been drawn in the Press to the practice of stone-throwing, from which **Belisha beacons** have suffered during recent months. There is, of course, nothing to be said in excuse for such wanton damage. Yet one may own to a sneaking sympathy with those who assail Belisha beacons, largely invisible by night and for the most part disregarded by day. I think it must be conceded that this method of marking **crossings for pedestrians** is greatly inferior to the use of **white cross lines** and still more inferior to the marking out of such lines by studs (cat's-eye reflectors and the like), which reflect light back from the automobile beams and enable the crossing to be identified a long way ahead.

In connection with our comment in our last issue on the reluctance of London Boroughs to turn out all lights at **midnight** in the interests of fuel economy, my attention has been drawn to the decision in a number of boroughs to adopt diminished lighting only, largely on the ground that some light is necessary to aid the Police in suppressing burglaries and other offences all too frequent of late.

Such **diminished lighting** is much more rational than a "**midnight black-out**," coming as it does at a time when the demand for gas and electricity is at its lowest, and the ensuing fuel economy must be minute. Diminished lighting is not uncommonly effected by turning out certain lights at regular intervals. This may, indeed, be the only feasible

method. It is, however, very much better to achieve the economy by reducing but not extinguishing the light from all lanterns, e.g., by extinguishing one or more of a group of lamps or mantles. The possibility of applying this method, which, whilst reducing the lighting as a whole, does not impair its even distribution, should be kept in mind in designing new lighting schemes.

I am occasionally asked for information in regard to means of **simplifying lighting calculations** and the plotting of isocandle and isolux diagrams. Readers will recall a recent contribution from Mr. J. G. Holmes on the latter subject (September, 1946, p. 158). Many members of I.E.S. Centres will also recall addresses on this topic by Mr. W. J. G. Davey, who is responsible for a number of ingenious devices for lightening the labour of calculations, such as the "lumen computer" and "distance grid" issued by Elm Works, Ltd. Incidentally, I must award high marks to this firm for their enterprise in incorporating in their "**Guide to Public Lighting**" isocandle charts of lanterns and iso-foot-candle diagrams showing the resultant distributions of illumination at various mounting heights.

I have heard some comments on the **low order of illumination**, ascribed to the use of lamps that have already endured very long service, **on some railway installations**. Doubtless many of the lamps in use are veterans; some perhaps have done duty ever since the out-

**break of war.** When, occasionally, one enters a coach that has been completely relighted the change is very striking. The railways, however, have to contend with one difficulty that reflects little credit on the travelling public—**thefts of lamps.** It is strange to learn that even lamps of low voltages, quite unsuitable for the usual domestic supply, are apt to vanish. Well may Mr. Cunningham, in his recent I.E.S. paper, remark that lighting fittings on railways must be not only fool-proof but also "hooligan-proof"!

### Fluorescent Lighting On A Sheffield Tramcar

On the occasion of their recent Jubilee the Sheffield Corporation Transport Department placed in service a new tramcar fitted with fluorescent lighting. A night view of the car is reproduced in Fig. 1, whilst Fig. 2 gives an impression of the interior lighting of the vehicle. The fluorescent lamps used throughout are of the 20-watt warm white bi-pin experimental type, and are 2 ft. in length by  $1\frac{1}{2}$  ft. in diameter. Those on the upper deck and platform are of the surface mounting type, whereas in the saloon the fittings are fully recessed. The illumination, both in the upper deck and in the saloon, is approximately 10 lumens per sq. ft. The installation has been the subject of very favourable public comment.

An interesting feature of this departure is that both a.c. and d.c. circuits are being tried out. Fluorescent lamps, though designed for a.c., may, under certain conditions, be used on d.c. circuits and the relative merits of the systems in actual service are now being explored. A 110-V 50 cycles/second motor-driven inductor type alternator furnishes current for the a.c. system, whilst the d.c. supply is taken direct from the 600-V traction circuit, incandescent lamps, with or without a resistance, being used for stabilising effect.

The equipment has been made and



Fig. 1. A night view of the new tramcar introduced by Sheffield Corporation fitted with fluorescent lighting.

supplied by Metropolitan-Vickers Electrical Company in conjunction with the Corporation engineers. Acknowledgement is due to Mr. R. C. Moore, General Manager of the Sheffield Corporation Transport Department, for permission to include the photographs accompanying this note and also to Mr. S. W. A. Sturman, the Rolling Stock Engineer.



Fig. 2. A view of the interior of the car showing arrangement of fluorescent units.

# LIGHT AND LIGHTING

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January—December, 1946

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